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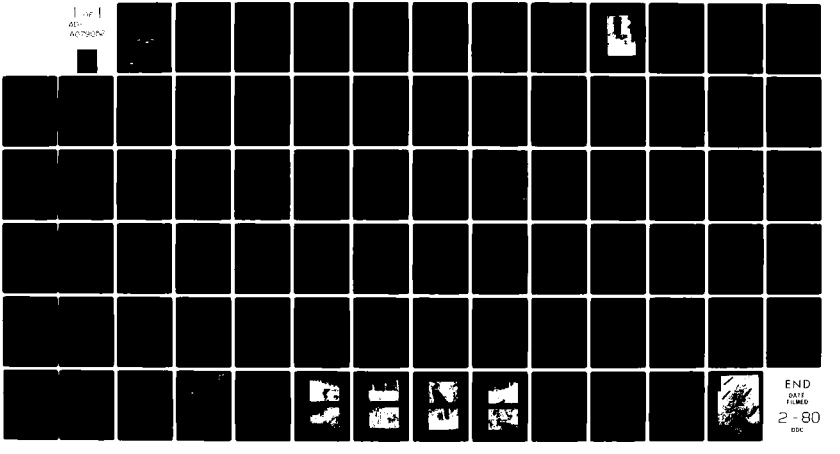

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SUSQUEHANNA RIVER BASIN
DRY VALLEY CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

ROCKY GLEN DAM

NDI ID NO. PA-00369
DER ID NO. 35-2

G. T. MANAGEMENT, INC.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Distribution Unlimited
Approved for Public Release
Contract No. DACW31-79-C-0015

Prepared by
GANNETT FLEMING CORDDRY AND CARPENTER, INC.
Consulting Engineers
Harrisburg, Pennsylvania 17105

For

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

JULY 1979

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July 1979

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

SUSQUEHANNA RIVER BASIN

DRY VALLEY CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

ROCKY GLEN DAM

NDI ID No. PA-00369
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G.T. MANAGEMENT, INC.

PHASE I INSPECTION REPORT

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JULY 1979

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BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam:	Rocky Glen Dam NDI ID No. PA-00369/DER ID No. 35-2
Owner:	G.T. Management, Inc.
State Located:	Pennsylvania
County Located:	Lackawanna
Stream:	Dry Valley Creek
Date of Inspection:	14 June 1979
Inspection Team:	Gannett Fleming Corddry and Carpenter, Inc. Consulting Engineers P.O. Box 1963 Harrisburg, Pennsylvania 17105

Based on visual inspection, available records, calculations, past operational performance, and according to criteria established for these studies, Rocky Glen Dam is judged to be unsafe, nonemergency, because the spillway capacity is rated as seriously inadequate. The existing spillway can pass only 7 percent of the Probable Maximum Flood (PMF) without overtopping of the dam. Because a portion of the masonry gravity dam is founded on earth and there are no erosion protection measures at the toe, it is assumed that the dam could not withstand the depth and duration of overtopping that would occur for the PMF or the 1/2 PMF. Failure of the dam would cause an increased hazard to loss of life downstream. As a whole, the dam is judged to be in fair condition.

Stability studies performed as part of this report indicate that the dam does not have any significant deviations from the Office of the Chief of Engineers (OCE) guidelines for stability.

Maintenance at the dam and operating facilities is inadequate. There is no program for regular inspection of the dam.

The following measures are recommended to be undertaken by the Owner, in approximate order of priority, immediately:

(1) Perform additional studies to more accurately ascertain the spillway capacity required for Rocky Glen Dam as well as the nature and extent of mitigation measures required to make the spillway hydraulically adequate. If the study recommends utilizing the top of dam as an auxiliary spillway, then both stability analyses and an investigation of the need for erosion protection measures should be performed. The studies should be performed by a professional engineer experienced in the design and construction of dams. Take appropriate action as required.

(2) Fill low areas at the ends of the dam to the design top of dam elevation.

(3) Remove all debris from the toe of the dam and spillway and have that portion of the dam and the spillway inspected by a professional engineer experienced in the design and construction of dams.

(4) Remove all weeds and brush from the dam and clear woods to a distance of at least 15 feet from the toe of the dam.

(5) Restore the outlet works to full operating condition.

(6) Make repairs to deteriorated stone masonry.

In addition, it is recommended that the Owner modify his operational procedures as follows:

(1) Develop a detailed emergency operation and warning system for Rocky Glen Dam.

(2) Provide round-the-clock surveillance of Rocky Glen Dam during periods of unusually heavy rains.

(3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system procedures.

(3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system.

(4) As presently required by the Commonwealth, institute a program of formal annual inspection by a professional engineer experienced in the design and construction of dams. Utilize the results to determine if remedial measures are necessary.

Submitted by:

FREDERICK COUNTY
DEPARTMENT OF PLANNING

FREDERICK POECHEL
Project Manager, Dam Section

Date: 7 August 1979

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

JAMES W. PECK
Colonel, Corps of Engineers

Date: 13 August 1979

ROCKY GLEN DAM

Overview

SUSQUEHANNA RIVER BASIN

DRY VALLEY CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

ROCKY GLEN DAM

NDI ID No. PA-00369
DER ID No. 35-2
G.T. MANAGEMENT, INC.

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

SECTION 1

PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Rocky Glen Dam is a masonry gravity dam with earthfill along its upstream side. The dam is 350 feet long and 19 feet high. The alignment is curved with a radius of 556 feet. The top width is 4 feet, the upstream face of the masonry is vertical, and the downstream face of the masonry has a slope of 2V on 1H. The level of the top of the

earthfill along the upstream face varies, but its average level is about 3.5 feet below the top of the dam. The slope of the earthfill is unknown. Most of the dam is founded on rock.

The free overfall spillway is located near the center of the dam. The weir is broad-crested but has an adverse slope. The spillway is 31.5 feet wide and the crest level is 1.5 feet lower than the top of the dam.

The outlet works consists of two 20-inch diameter cast-iron pipes (CIP) located to the right of the spillway. The type of structure at the intake is unknown. A valve house is located at the downstream toe of the dam. Two gate valves are located on the downstream end of each CIP. Both the spillway and the outlet works discharge into the natural stream valley downstream from the dam. The various features of the dam are shown on the Plates at the end of the report and on the Photographs in Appendix D.

b. Location. The dam is located on Dry Valley Creek approximately 1.6 miles east of Moosic, Pennsylvania. Rocky Glen Dam is shown on USGS Quadrangle, Avoca, Pennsylvania, with coordinates N41°21'10" -W75°42'25", in Lackawanna County, Pennsylvania. The location map is shown on Plate 1.

c. Size Classification. Small (19 feet high, 281 acre-feet).

d. Hazard Classification. High hazard. Downstream conditions indicate that a high hazard classification is warranted for Rocky Glen Dam (Paragraphs 3.1e and 5.1c(4)).

e. Ownership. G.T. Management, Inc., Moosic, Pennsylvania.

f. Purpose of Dam. Recreation.

g. Design and Construction History. Rocky Glen Dam was constructed by the Rocky Glen Water Company in 1903. The design engineer was G. E. Stevenson, Consulting Engineer, of Scranton. The Contractor for the dam was E. S. Williams. Shortly after completion of the dam, the Lackawanna and Wyoming Valley Railroad constructed a rock fill embankment through the reservoir for two railroad

tracks. About 95 percent of the reservoir is upstream from the railroad fill. A bridge and a box culvert provided connections between the two sections of the reservoir. The railroad tracks were abandoned at an unknown time. The dam has had no major modifications since its completion.

h. Normal Operational Procedure. The reservoir is normally maintained at the spillway crest level. The gate valves on one of the outlet pipes are normally open a small amount to increase streamflow downstream from the dam. The gate valves on the other outlet pipe are normally closed.

1.3 Pertinent Data.

a. Drainage Area. (square miles)	1.50
b. Discharge at Damsite. (cfs.)	
Maximum known flood at damsite	Unknown
Outlet works at maximum pool elevation	90
Spillway capacity at maximum pool elevation.	
Design conditions	182
Existing conditions	174
c. Elevation. (feet above msl.)	
Top of dam	
Design conditions	762.35
Existing condtions	762.20
Maximum pool	
Design conditions	762.35
Existing conditions	762.20
Normal pool (spillway crest)	760.7
Upstream invert outlet works	748.0
Downstream invert outlet works	747.0
Streambed at toe of dam	743.0
d. Reservoir Length. (miles)	
Normal pool	0.74
Maximum pool	0.77
e. Storage. (acre-feet)	
Normal pool	218
Maximum pool	281

f.	Reservoir Surface. (acres)	
	Normal pool	37
	Maximum pool	42
g.	Dam.	
	Type	Masonry gravity with upstream earthfill
	Length (feet)	350
	Height (feet)	19
	Topwidth (feet)	4
	Side Slopes	
	Upstream Masonry	Vertical
	Upstream Earthfill	Unknown
	Downstream Masonry	2V on 1H
	Zoning	None
	Cutoff	Masonry on rock or in trench into earth.
	Grout Curtain	None
h.	Diversion and Regulating Tunnel	None
i.	Spillway.	
	Type	Free overfall; broad-crested weir with adverse slope.
	Length of Weir (feet)	
	Design	30
	Existing	31.5

i.	Spillway. (Cont'd.)	
	Crest Elevation	760.7
	Upstream Channel	Reservoi.
	Downstream Channel.	Natural valley.
j.	Regulating Outlets.	
	Type.	Two 20-inch diameter cast-iron pipes side by side.
	Length (feet).	45
	Closure	2 gate valves on downstream end of each pipe.
	Access	Valve house at toe of dam.

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Data Available. Design data available for review was limited to a plan of the dam and a report prepared by the Pennsylvania Water Supply Commission in 1914. The report by the Water Supply Commission included the results of stability and hydraulic analyses for the dam. A copy of a set of specifications was available, but did not seem to be applicable since the specifications were for construction of a concrete dam.

b. Design Features. The dam and appurtenances are described in Paragraph 1.2a. The design features are shown on the Plates at the end of the report and on the Photographs in Appendix D. The dam and spillway are shown on Plates 1 and 2 and on Photographs A, B, C, D, and E. The outlet works is shown on Plate 1 and on Photograph G. The 1914 report by the Pennsylvania Water Supply Commission indicates that the dam is founded on rock except for a portion at the left abutment, where the dam rests on clay. The earthfill on the upstream side of the dam was material taken from required excavation for the foundation. No design slope is available for the earthfill.

c. Design Considerations. Design considerations are discussed in Sections 5 and 6.

2.2 Construction.

a. Data Available. Construction information consists of as-built masonry sections and profiles along the top of the dam and along the foundation. A brief description of some of the work is contained in the 1914 report by the Pennsylvania Water Supply Commission.

b. Construction Considerations. The available information is not sufficient to assess the construction of the dam.

2.3 Operation. There are no formal records of operation. Based on the periodic inspections performed by the Commonwealth over the last 65 years (Appendix A), it appears that all structures have performed satisfactorily.

2.4 Evaluation.

a. Availability. Engineering data were provided by the Bureau of Dam Safety, Obstructions, and Storm Water Management, Department of Environmental Resources, Commonwealth of Pennsylvania (PennDER). The Operations Manager for the Owner researched the files for additional information upon request of the inspection team, but no information was available.

b. Adequacy. The type and amount of design data and other engineering data is very limited. The assessment must be based on the combination of available data, visual inspection, performance history, hydrologic assumptions, and hydraulic assumptions.

c. Validity. There is no reason to question the validity of the available data.

SECTION 3

VISUAL INSPECTION

3.1 Findings.

a. General. The overall appearance of the dam is fair, with deficiencies as noted herein. The locations of deficiencies are shown in Appendix B on Plate B-1. Survey data acquired during this inspection are presented in Appendix B. Datum for the survey was assumed at the design elevation of the spillway crest, El. 760.7. On the day of the inspection, the pool was 0.2 foot above the spillway crest.

b. Embankment. The entire earthfill along the upstream face of the dam was submerged and could not be inspected. The survey data (Appendix B) indicates that the top elevation of the earthfill varies from a minimum of Elevation 757.7 at the spillway to a maximum of Elevation 760.2 at the abutments. The slope of the earthfill could not be determined by survey. It appeared to be very flat.

c. Masonry Dam and Spillway. Only a small portion of the upstream face of the dam was visible. Where exposed, mortar was observed to be missing at some joints. Small to medium size weeds and brush were growing in the masonry above normal pool level (Photographs A and B). The top of the dam was generally in good condition. Some stones were missing adjacent to the spillway. Grass and small weeds were growing at masonry joints where dirt had accumulated (Photographs A and B), but the mortar was generally intact. Most of the downstream face of the dam was covered with weeds and brush (Photographs C and D). Mortar was missing from many joints. Occasional slight seepage was observed on the downstream face (Photograph D), but there were no areas with substantial, concentrated flow. The entire area along the toe of the dam was heavily wooded. One wet area was located at the toe near the right abutment, but the water appeared to be stagnant. The area was not particularly soft.

A substantial portion of the downstream face and toe of the dam, extending across the width of the spillway and to some distance on either side of it, could not be inspected due to a massive accumulation of debris. The

uninspected area was approximately 100 feet long, or about 30 percent of the total length of the dam. The debris consisted of logs, lumber, railroad ties, and other miscellaneous trash. The debris was accumulated from the bottom of the dam to just below spillway crest level (Photographs E and F). The debris caused spillway flow to spread greatly, and any seepage or wet areas would have been obscured by the resulting multiple flow paths. The spillway weir itself was in good condition except for stones missing along its sides (Photograph E).

The intake facilities of the outlet works were submerged and could not be inspected. The two cast-iron pipes (CIP) appeared to be in good condition based on their appearance at the downstream ends. The valve house at the toe of the dam was in fair condition (Photograph G). Some of its mortar joints were in poor condition and some stones were missing. Substantial flow was issuing from the doorway of the valve house. Inspection revealed that most, if not all, of the flow was caused by one of the gate valves that had been partially disassembled. Two gate valves were located on each CIP. The valves on the right pipe were closed and there was no flow. The upstream valve on the left conduit was open, and the downstream valve had its bonnet and leaf removed. The resulting leakage and spray were causing the flow from the valve house. The other valves appeared to be in satisfactory condition.

The outlet channels for both the spillway and the outlet works are poorly defined. The debris and thick woods cause multiple flow paths to exist that converge farther downstream.

d. Reservoir Area. Most of the watershed is wooded and undeveloped. Slopes vary from mild to steep, and some swampy areas exist. A very small pond is located about 0.3 mile upstream from Rocky Glen Dam. Interstate Route 81 goes through a part of the watershed (Plate 1). An abandoned railroad embankment separates the reservoir into two parts. The embankment is higher than the top of the dam and has a 25-foot top width. A bridge that once spanned a waterway opening in the embankment is no longer there (Photograph H). The bridge abutments were deteriorated and indications of substantial erosion were present (Photograph H). The left overbank adjacent to the dam is wooded. The right overbank adjacent to the dam is obstructed by a high, chain-link security fence.

e. Downstream Channel. Dry Valley Creek flows into Covey Creek 0.2 mile downstream from Rocky Glen Dam. A cigar factory, with an estimated 25 employees, is located along Covey Creek 0.1 mile downstream from the confluence, or 0.3 mile downstream from the dam. Covey Creek flows under a large bridge on the Northeast Extension of the Pennsylvania Turnpike 0.5 mile downstream from the dam. At a distance of 0.7 mile downstream from Rocky Glen Dam, Covey Creek enters Spring Brook. In the area immediately downstream from that confluence, there are about 15 low-lying houses in the community of Spike Island. Other low-lying houses are along Spring Brook between Spike Island and the confluence of Spring Brook with the Lackawanna River, which is located 2.2 miles from the dam in the Borough of Moosic. The Borough of Moosic is protected by the Spring Brook Flood Control Project that was constructed by the Commonwealth.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedure. The reservoir is maintained at spillway crest level, Elevation 760.7, with excess inflow discharging over the spillway. The valves on one of the two 20-inch outlet conduits are normally open for increasing streamflow downstream from the dam. The valves on the other conduit are normally closed. Each winter the pool is normally drawn down about 9 feet and kept at that level to protect boating facilities from ice damage and to allow cleanup of debris in the reservoir area.

4.2 Maintenance of Dam. The Construction Supervisor of G.T. Management, Inc., is responsible for maintenance of the dam. He was not available at the time of the inspection. The Operations Manager, who was the previous Construction Supervisor, provided information concerning operation of the dam. The condition of the dam is observed infrequently. There is no program of regular inspection or maintenance.

4.3 Maintenance of Operating Facilities. The gate valves on the left conduit are not operated. The wrench flats are rounded off. The gate valves on the right conduit are operated at least annually to draw down the pool for winter conditions. As noted in the visual inspection, one of the valves was partially disassembled. Maintenance of the operating facilities is minimal.

4.4 Warning Systems in Effect. The Operations Manager stated that there was no emergency operation or warning plan.

4.5 Evaluation of Operational Adequacy. The maintenance of the dam and operating facilities is inadequate. Inspections are necessary to detect hazardous conditions at the dam. As described hereafter, the failure of the dam would cause an increased hazard to loss of life downstream. An emergency operation and warning system is necessary to mitigate the hazards downstream, should there be evidence of stress at the dam.

SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. The 1914 report by the Pennsylvania Water Supply Commission included an estimate of spillway capacity. Based on a length of 30 feet, a head of 1.6 feet, and a weir coefficient of 3.0, the estimated capacity was 182 cfs. The Commission indicated that the spillway capacity was inadequate. However, they also concluded that the dam might withstand small depths of overtopping for short periods of time without resulting in significant damage. Review of the as-built sections indicates that most of the dam is similar in section and founded on conglomerate rock. Although it is not clearly shown on the plans, the Commission reported that a portion of the dam at the left abutment is founded on clay. Therefore, a significant amount and duration of overtopping could cause erosion and undermining of the structure. The dam cannot be considered suitable for resisting more than minor overtopping.

b. Experience Data. The flood of record at Rocky Glen Dam is not known. The Owner stated that he was unaware of any previous overtopping.

c. Visual Observations.

(1) General. The visual inspection of Rocky Glen Dam, which is described in Section 3, resulted in a number of observations relevant to hydrology and hydraulics. These observations are evaluated herein for the various features.

(2) Dam and Spillway. The survey of the top of the dam (Appendix B) showed that the top is at Elevation 762.4. There are slightly lower areas at each end of the dam, the lowest being at Elevation 762.2. These low areas were ignored in the hydraulic analysis because of their limited extent and because they would not materially affect the results of the analysis. The survey also showed that the spillway width is 31.5 feet instead of 30 feet as shown in the records.

The massive accumulation of debris at the downstream toe is not a hazard except that it hinders visual inspection.

(3) Reservoir Area. No conditions were observed in the reservoir area that might present significant hazard to the dam. The assessment of the dam is based on existing conditions, and the effects of future development are not considered. The small pond located upstream from the dam is not considered to have significant effects on the hydrology or hydraulics. The location of Interstate Route 81 within the watershed is such that its effects should be minimal. The waterway opening in the abandoned railroad embankment would easily be eroded to a much larger opening if a head differential were to develop between the two portions of the reservoir. Therefore, it would not act as a hydraulic control either for normal spillway flow or in the event of dam failure.

(4) Downstream Conditions. No conditions were observed downstream from the dam that would affect the hydraulics of the dam. If the dam should fail, a hazard would exist to one factory and to a number of dwellings in Spike Island. Because of the possibility of flooding dwellings, a high hazard classification is warranted for Rocky Glen Dam.

d. Overtopping Potential.

(1) Spillway Design Flood. According to the criteria established by the Office of the Chief of Engineers (OCE) for the size (Small) and hazard potential (High) of Rocky Glen Dam, the Spillway Design Flood (SDF) is between one-half of the Probable Maximum Flood (PMF) and the PMF. Because of the downstream conditions, the PMF is selected as the SDF for Rocky Glen Dam.

(2) Description of Model. The watershed was modeled with the HEC-1DB computer program. The HEC-1DB computer program computes a PMF runoff hydrograph and routes the flows through both reservoirs and stream sections. In addition, it has the capability to simulate an overtopping dam failure. The PMF inflow to Rocky Glen Reservoir was determined and routed through the dam. Identical methods were used for various percentages of the PMF.

(3) Summary of Results. Pertinent results are tabulated at the end of Appendix C. The analysis reveals that Rocky Glen Dam can pass about 7 percent of the PMF without overtopping.

(4) Spillway Adequacy. The criteria used to rate the spillway adequacy of a dam are described in Appendix C. Because substantial overtopping is assumed to cause erosion at the toe and therefore failure, and because the dam is overtopped during the 1/2 PMF, a further analysis was performed. It was assumed that Rocky Glen Dam would fail, during the 1/2 PMF, over a 100-foot length near the left abutment after being overtopped by 1.3 feet. This would result in a peak outflow of about 25,000 cfs. When routed downstream to the cigar factory, it would raise the tailwater by 7.5 feet over the water surface, were the dam not to fail. There is an increased hazard to loss of life. The spillway capacity is rated as seriously inadequate.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) General. The visual inspection of Rocky Glen Dam, which is described in Section 3, resulted in a number of observations relevant to structural stability. These observations are evaluated herein for the various features.

(2) Embankment. The earthfill on the upstream side of the masonry gravity dam appeared to have a very flat slope. The earth loadings due to this earthfill would have an unfavorable effect on the stability of the dam.

(3) Dam and Spillway. The substantial vegetation growing on the dam promotes deterioration of the masonry joints. At present, the loss of mortar does not appear to have caused significant structural damage. The vegetation also makes inspections difficult.

A large portion of the dam, about 30 percent of the total length, could not be inspected due to the massive accumulation of debris.

In the areas that could be inspected, there were no signs of significant seepage or abnormally soft areas.

b. Design and Contruction Data. The 1914 report by the Pennsylvania Water Supply Commission included the results of stability analyses for Rocky Glen Dam. The most severe case that was considered used water level at the top of the dam and uplift varying from 2/3 static head at the heel to zero at the toe. The resultant fell within the middle third, 6 inches from the third point. The toe pressures and factor of safety against sliding were adequate. The analyses did not consider loadings caused by the upstream earthfill.

Two stability analyses were performed for this study. The maximum section on rock was analyzed and stability checked at its base for two cases. The section

founded on clay was not analyzed because substantial passive resistance is available due to the depth of embedment of the section. Both normal summer pool operating condition and the PMF condition were checked at the maximum section. Earth loads from the fill along the upstream face were considered. The PMF loading used an assumed tailwater level of 3 feet and uplift varying from tailwater at the toe to tailwater plus 2/3 the difference between headwater and tailwater at the heel. For this loading condition, the resultant is outside the middle third but within the base, about 1.3 feet from the toe of the dam. The toe pressures and factor of safety against sliding were found to be satisfactory.

For the normal summer pool operating condition, the pool was at spillway crest level and there was no tailwater. For this case, the resultant was located outside the middle third, but within the base, about 4.4 feet from the toe. The toe pressure and the factor of safety against sliding were adequate. The guidelines of the Office of the Chief of Engineers (OCE) state that the resultant should be within the middle third of the base. However, since both the toe pressure and the factor of safety against sliding were satisfactory, the location of the resultant being outside of the middle third of the base is not considered to be a significant deviation from OCE guideline.

It is noted that the analyses were based on a number of assumptions concerning material properties, and that the results are only an approximation.

c. Operating Records. There are no formal records of operation. According to the Operations Manager, no stability problems are known to have occurred over the operational history of the dam.

d. Postconstruction Changes. There have been no postconstruction changes to Rocky Glen Dam.

e. Seismic Stability. Rocky Glen Dam is located in Seismic Zone 1. Normally it can be considered that if a dam in this zone has adequate factors of safety under static loading conditions, it can be assumed safe for any expected earthquake loading. However, since there are no formal static stability analyses, and since there is the potential of earthquake forces moving or cracking the masonry gravity section, the theoretical seismic stability of this dam cannot be assessed.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND

PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety.

(1) Based on visual inspection, available records, calculations, and past operational performance, Rocky Glen Dam is judged to be in fair condition. However, the existing spillway will pass only 7 percent of the PMF without overtopping of the dam. Because a portion of the masonry gravity dam is founded on earth and there are no erosion protection measures at the toe, it is assumed that the dam could not withstand the depth and duration of overtopping that would occur for the PMF or the 1/2 PMF. Failure of the dam would cause an increased hazard to loss of life downstream. The spillway is rated as seriously inadequate. According to criteria established for these studies, the dam is rated as unsafe, non-emergency, because the spillway capacity is seriously inadequate.

(2) Stability studies performed as part of this report indicate that the dam does not have any significant deviation from the OCE guideline for stability.

(3) A summary of the features and observed deficiencies is listed below:

Feature and Location	Observed Deficiencies
Masonry Dam and Spillway:	
Upstream face	Mortar deteriorated; weeds and brush
Top of dam	Stones missing at spillway.
Downstream face	Mortar missing at many joints; slight seepage; covered with weeds and brush.

Feature and Location	Observed Deficiencies
Masonry Dam and Spillway:	
Downstream toe	Massive accumulation of debris; heavily wooded; possibly seepage.
Spillway outlet channel	Poorly defined
Outlet Works:	
Valve house	Mortar deteriorated
Valves	One valve disassembled; two valves not operable.
Outlet channel	Poorly defined

b. Adequacy of Information. The information available is such that an assessment of the condition of the dam can be inferred from the combination of visual inspection, past performance, and computations performed prior to and as part of this study.

c. Urgency. The recommendations in Paragraph 7.2 should be implemented immediately.

d. Necessity for Further Investigations. In order to accomplish some of the remedial measures outlined in Paragraph 7.2, further investigations by the Owner will be required.

7.2 Recommendations and Remedial Measures.

a. The following measures are recommended to be undertaken by the Owner, in approximate order of priority, immediately:

(1) Perform additional studies to more accurately ascertain the spillway capacity required for Rocky Glen Dam as well as the nature and extent of mitigation measures required to make the spillway hydraulically adequate. If the study recommends utilizing the top of dam as an

auxiliary spillway, then both stability analyses and an investigation of the need for erosion protection measures should be performed. The studies should be performed by a professional engineer experienced in the design and construction of dams. Take appropriate action as required.

(2) Fill low areas at the ends of the dam to the design top of dam elevation.

(3) Remove all debris from the toe of the dam and spillway and have that portion of the dam and the spillway inspected by a professional engineer experienced in the design and construction of dams.

(4) Remove all weeds and brush from the dam and clear woods to a distance of at least 15 feet from the toe of the dam.

(5) Restore the outlet works to full operating condition.

(6) Make repairs to deteriorated stone masonry.

b. In addition, it is recommended that the Owner modify his operational procedures as follows:

(1) Develop a detailed emergency operation and warning system for Rocky Glen Dam.

(2) Provide round-the-clock surveillance of Rocky Glen Dam during periods of unusually heavy rains.

(3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system procedures.

(4) Institute an inspection program such that the dam is inspected frequently. As presently required by the Commonwealth, the program should include a formal annual inspection by a professional engineer experienced in the design and construction of dams. Utilize the results to determine if remedial measures are necessary.

(5) Institute a maintenance program to properly maintain all features of the dam.

SUSQUEHANNA RIVER BASIN

DRY VALLEY CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

ROCKY GLEN DAM

NDI ID No. PA-00369
DER ID No. 35-2

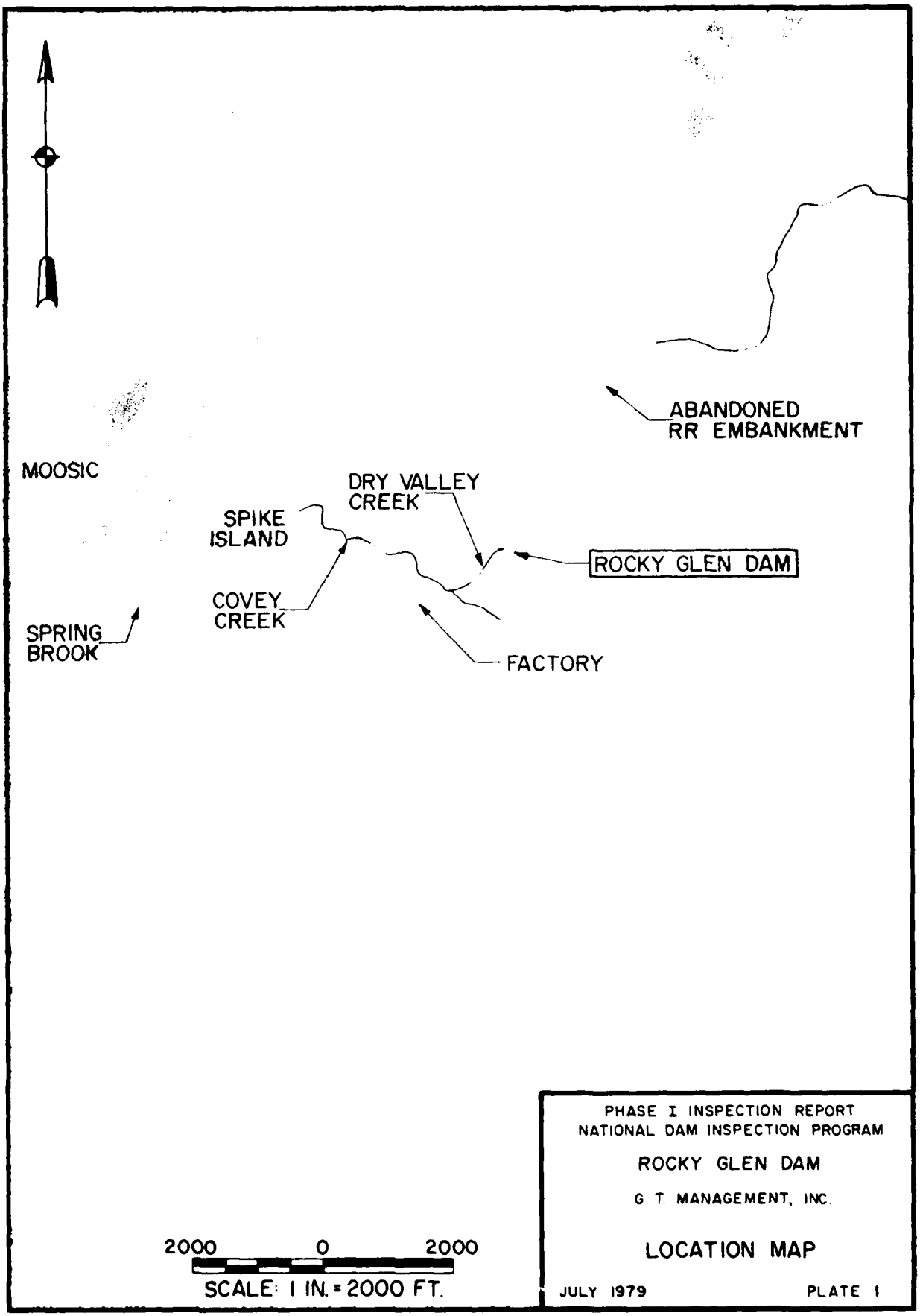
G.T. MANAGEMENT, INC.

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1979

PLATES



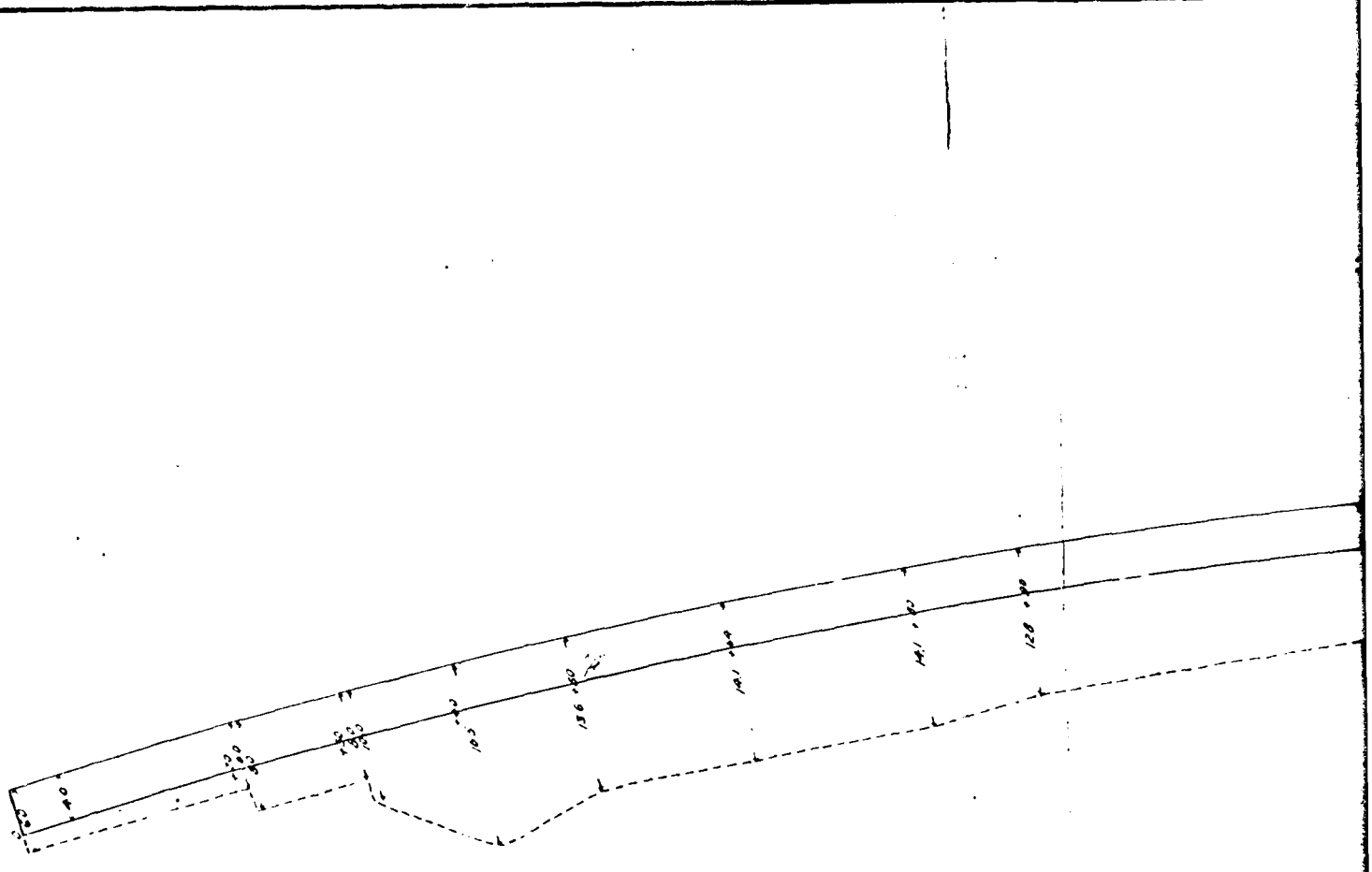
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

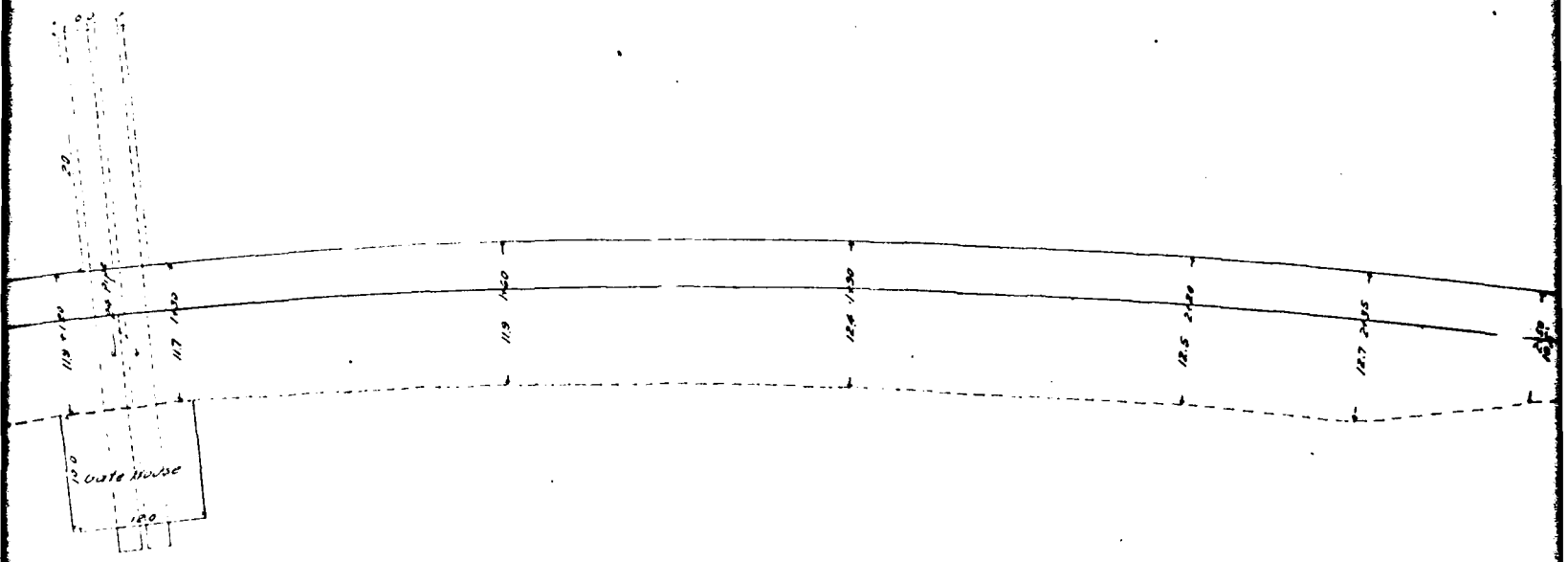
ROCKY GLEN DAM

G. T. MANAGEMENT, INC.

LOCATION MAP

JULY 1979 PLATE 1

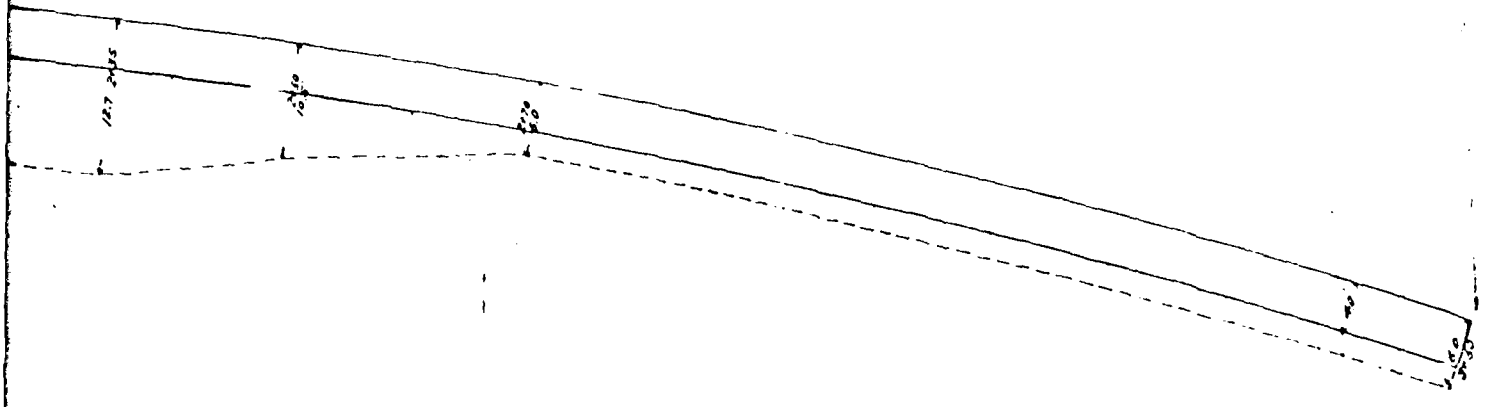




Plan
of
Dam at Rocky Glen

Scale 1"=10'

Office of Stevenson & Knight Engrs.
726-727 Connell Bldg
Scranton, Pa.



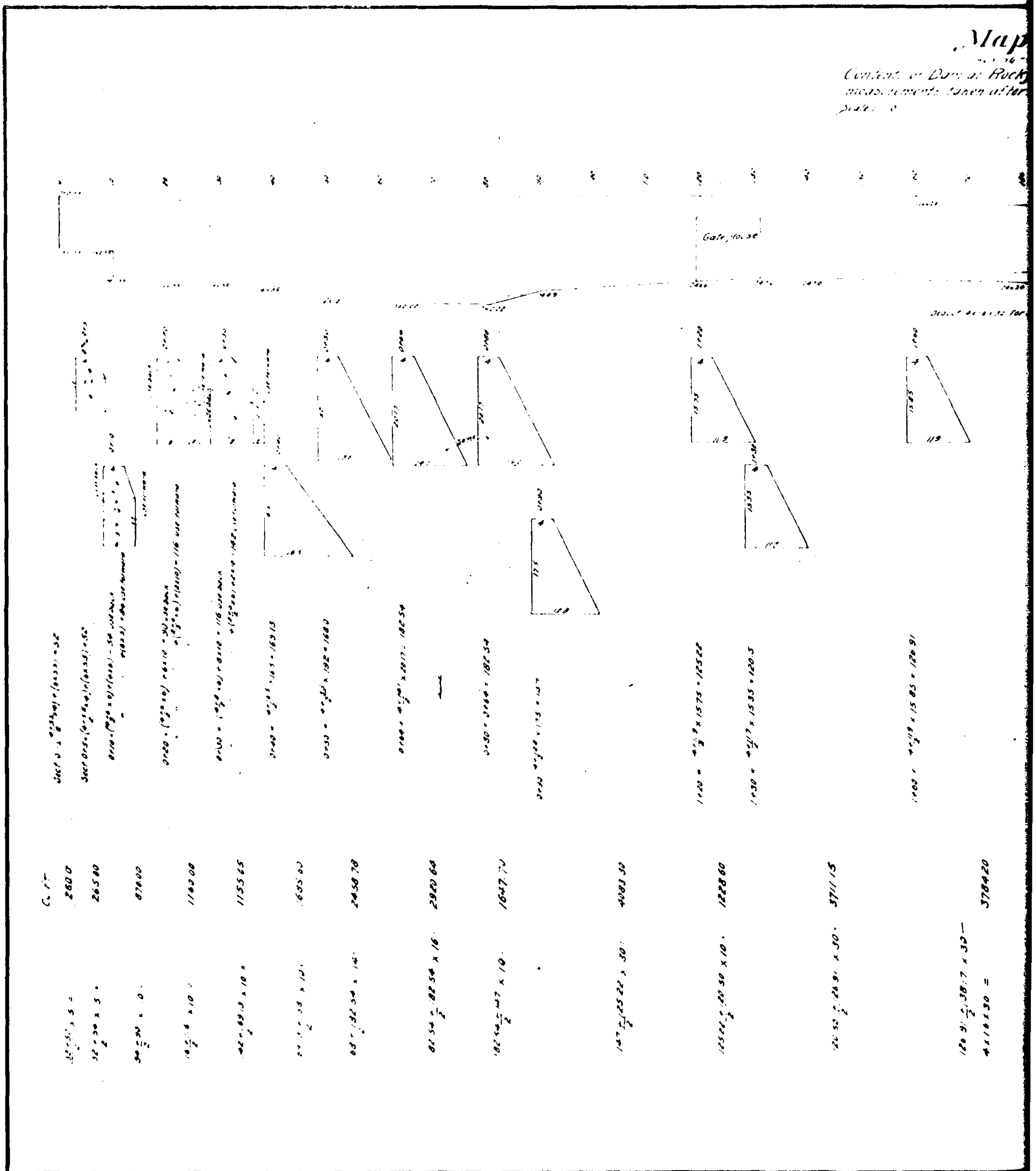
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

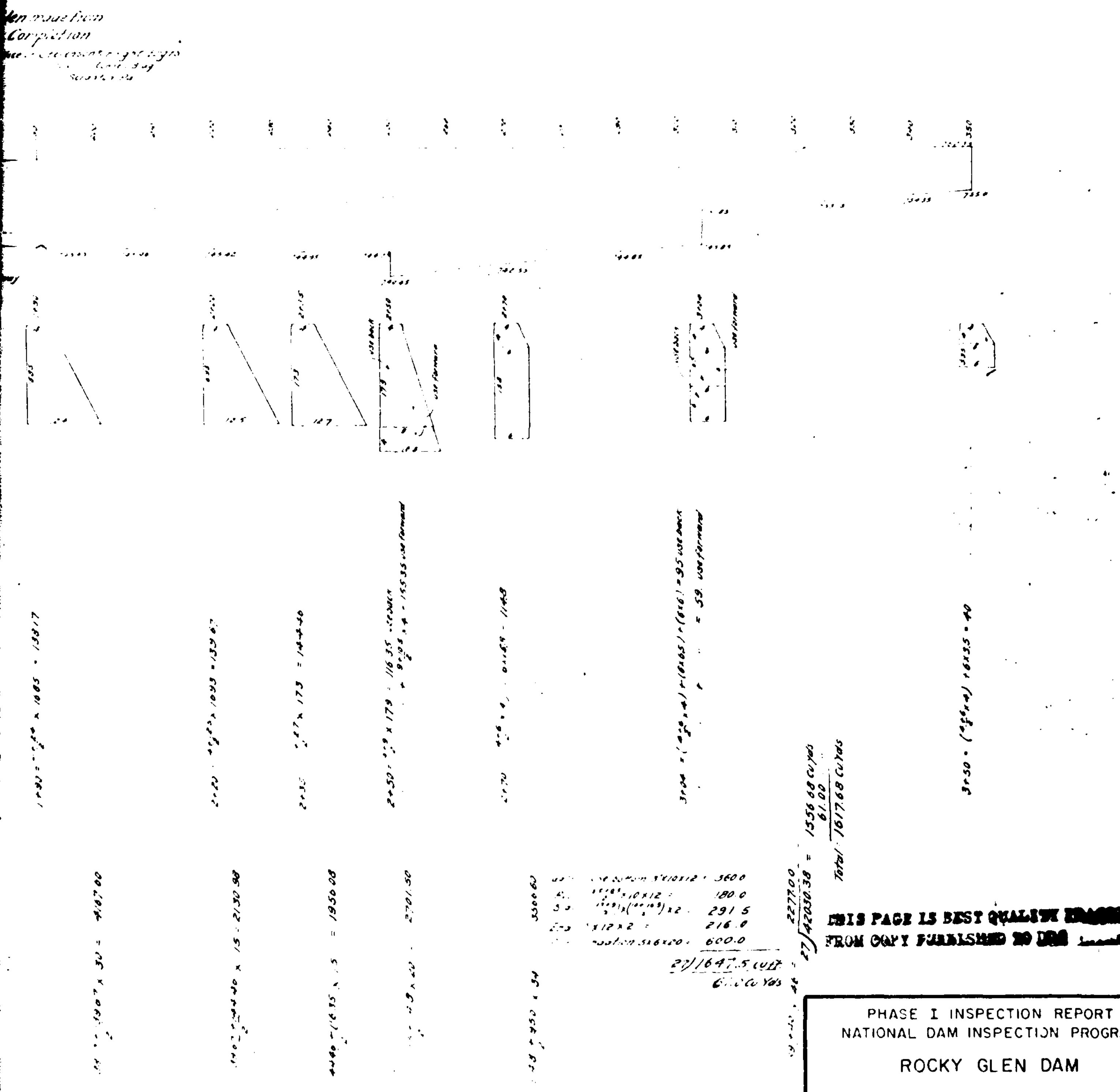
ROCKY GLEN DAM

G T MANAGEMENT, INC.

PLAN

JULY 1979 PLATE 2


Map
Contents of Dam at Rocky
measurements taken after
Scale
Gate House



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ROCKY GLEN DAM

G T MANAGEMENT, INC.

PROFILE AND SECTIONS

JULY 1979 PLATE 3

SUSQUEHANNA RIVER BASIN

DRY VALLEY CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

ROCKY GLEN DAM

NDI ID No. PA-00369
DER ID No. 35-2

G.T. MANAGEMENT, INC.

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1979

APPENDIX A

CHECKLIST - ENGINEERING DATA

CHECKLIST

ENGINEERING DATA

DESIGN, CONSTRUCTION, AND OPERATION
PHASE I

NAME OF DAM: Rocky Glen Dam

NDS ID NO.: PA-00369 DER ID NO.: 35-2

Sheet 1 of 4

ITEM	REMARKS
AS-BUILT DRAWINGS	Plan, profile, and masonry sections. See Plates 2 and 3.
REGIONAL VICINITY MAP	See Plate 1.
CONSTRUCTION HISTORY	Constructed 1903 by Rocky Glen Water Company. No significant modifications.
TYPICAL SECTIONS OF DAM	See Plate 3.
OUTLETS: Plan Details Constraints Discharge Ratings	Plan only. See Plate 2.

A-1

ENGINEERING DATA

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	None.
DESIGN REPORTS	1914 Pennsylvania Water Supply Commission Report.
GEOLOGY REPORTS	1914 Pennsylvania Water Supply Commission Report.
DESIGN COMPUTATIONS: Hydrology and Hydraulics Dam Stability Seepage Studies	Results of hydraulic and stability analyses in 1914 Pennsylvania Water Supply Commission Report.
MATERIALS INVESTIGATIONS: Boring Records Laboratory Field	None.
POSTCONSTRUCTION SURVEYS OF DAM	None.

ENGINEERING DATA

ITEM	REMARKS
BORROW SOURCES	Unknown.
MONITORING SYSTEMS	None.
MODIFICATIONS	None.
HIGH POOL RECORDS	None.
POSTCONSTRUCTION ENGINEERING STUDIES AND REPORTS	1914 Report by Pennsylvania Water Supply Commission.
PRIOR ACCIDENTS OR FAILURE OF DAM: Description Reports	None.

ENGINEERING DATA

ITEM	REMARKS
MAINTENANCE AND OPERATION RECORDS	None.
SPILLWAY: Plan Sections Details	See Plates 2 and 3.
OPERATING EQUIPMENT: Plans Details	See Plate 2.
PREVIOUS INSPECTIONS Dates Deficiencies	1920 - Slight leakage around right end and through masonry. 1924 - Masonry joints need repairs; spillway crest uneven; small leak at right end; seepage at spillway; debris. 1928 - Disintegration of masonry joints; seepage at right end. 1930 - Masonry joints deteriorated; slight seepage through masonry; outlets sealed with concrete. 1933 - Outlets sealed with concrete; crest joints repointed; slight seepage at toe near right end; slight seepage through masonry.

ENGINEERING DATA

ITEM	REMARKS
Previous Inspections (Continued)	1953 - Brush and trees growing in masonry joints; Leakage through masonry - large amount at spillway. 1957 - Slight leakage along toe; outlet channel obstructed by trees and debris.
	1965 - Small trees and brush on downstream face; outlet channel clogged with logs, lumber, and debris.

SUSQUEHANNA RIVER BASIN

DRY VALLEY CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

ROCKY GLEN DAM

NDI ID No. PA-00369
DER ID No. 35-2

G.T. MANAGEMENT, INC.

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1979

APPENDIX B

CHECKLIST - VISUAL INSPECTION

CHECKLIST

VISUAL INSPECTION

PHASE I

Name of Dam: Rocky Glen Dam County: Lackawanna State: Pennsylvania

NDS ID No.: PA-00369 DER ID No.: 35-2

Type of Dam: Masonry gravity; upstream earthfill Hazard Category: High

Date(s) Inspection: 14 June 1979 Weather: Clear Temperature: 75°

Pool Elevation at Time of Inspection: 760.9 msl/Tailwater at Time of Inspection: 746.8 msl

Inspection Personnel:

A.H. Whitman (GFCC)

D.R. Ebersole (GFCC)

D. B. Wilson (GFCC) Recorder

EMBANKMENT

Sheet 1 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Upstream earthfill entirely submerged.	Could not inspect.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	N/A	
SLOUGHING OR EROSION: Embankment Slopes Abutment Slopes	N/A	
CREST ALIGNMENT: Vertical Horizontal	See survey data for top of earthfill elevations.	
RIPRAP FAILURES	N/A	

EMBANKMENT

Sheet 2 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: Abutment Spillway Other Features	N/A	
ANY NOTICEABLE SEEPAGE	N/A	
STAFF GAGE AND RECORDER	N/A	
DRAINS	N/A	

CONCRETE/MASONRY DAMS

Sheet 1 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE (Downstream Face and Toe)	Left of spillway: occasional to increase near spillway. Spillway area: indeterminate - too much debris. Right of spillway: wet areas on face - no substantial flow; wet area along toe (water stagnant).	slight seeps on face; tends
JUNCTION OF STRUCTURE WITH: Abutment Embankment Other Features	No abnormalities.	
DRAINS	None.	
WATER PASSAGES	See Outlet Works.	
FOUNDATION	No apparent abnormalities.	

CONCRETE/MASONRY DAMS

Sheet 2 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
~~CONCRETE SURFACES~~: ~~Surface Cracks~~ ~~Spalling~~ Masonry Surfaces.	Upstream face: Mostly submerged and covered with earthfill; small to medium weeds and brush above normal pool. Top: Stones missing left side spillway; light vegetation. Downstream face: Mostly covered with small to medium weeds and brush.	
STRUCTURAL CRACKING	None.	
ALIGNMENT: Vertical Horizontal	See Survey Data.	
MASONRY ~~MONOLITH~~ JOINTS	Upstream face: mortar missing at some joints. Top: mortar at joints generally satisfactory. Downstream face: mortar generally in poor condition; missing at numerous joints; less severe to right of spillway.	
CONSTRUCTION JOINTS	N/A	
STAFF GAGE OR RECORDER	None.	

OUTLET WORKS

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
~~CRACKING AND SPALLING OF CONCRETE SURFACES IN~~ OUTLET CONDUIT	Two 20-inch CIP's. No apparent deficiencies in pipes.	Left pipe flowing. Right pipe dry.
INTAKE STRUCTURE	Submerged - could not inspect.	
OUTLET STRUCTURE	Valvehouse: mortar joints in poor condition; some stone missing. Two gate valves on each pipe. Downstream valve on left conduit has bonnet removed - the resulting leakage and spray causes standing and flowing water in valvehouse.	
OUTLET CHANNEL	Located adjacent to spillway; wooded, poorly defined, some debris.	
EMERGENCY GATE	No closure for upstream end.	

UNGATED SPILLWAY

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MASONRY ~~CONCRETE~~ WEIR	Broad-crested weir with adverse slope. Generally good condition.	Stones missing from top of dam at left side of spillway.
APPROACH CHANNEL	Reservoir; no obstructions.	
DISCHARGE CHANNEL	Massive amounts of debris from bottom of structure to just below spillway crest.	
BRIDGE AND PIERS	None.	

INSTRUMENTATION

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	None.	

RESERVOIR AND WATERSHED

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Mild to steep; wooded.	No evidence of instability.
SEDIMENTATION	None apparent.	
WATERSHED DESCRIPTION	Wooded; mostly undeveloped; some swampy areas. Route 81 goes through part of watershed (does not appear to significantly affect H&H); small pond located 0.3 mile upstream. Pond not inspected due to size on USGS map.	
RESERVOIR AREA	Abandoned R.R. embankment through lake (See Plate 1). Bridge removed. Embankment higher than top of dam. Bridge abutments deteriorated (i.e. could erode easily and would not act as a hydraulic control).	

DOWNSTREAM CHANNEL

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION: Obstructions Debris Other	Poorly defined at spillway. Much debris; heavily wooded.	Large amounts of debris cause flow to spread to a width of about 100 feet.
SLOPES	mild to steep.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	Cigar factory with about 25 employees; about 15 low-lying houses in community of Spike Island.	

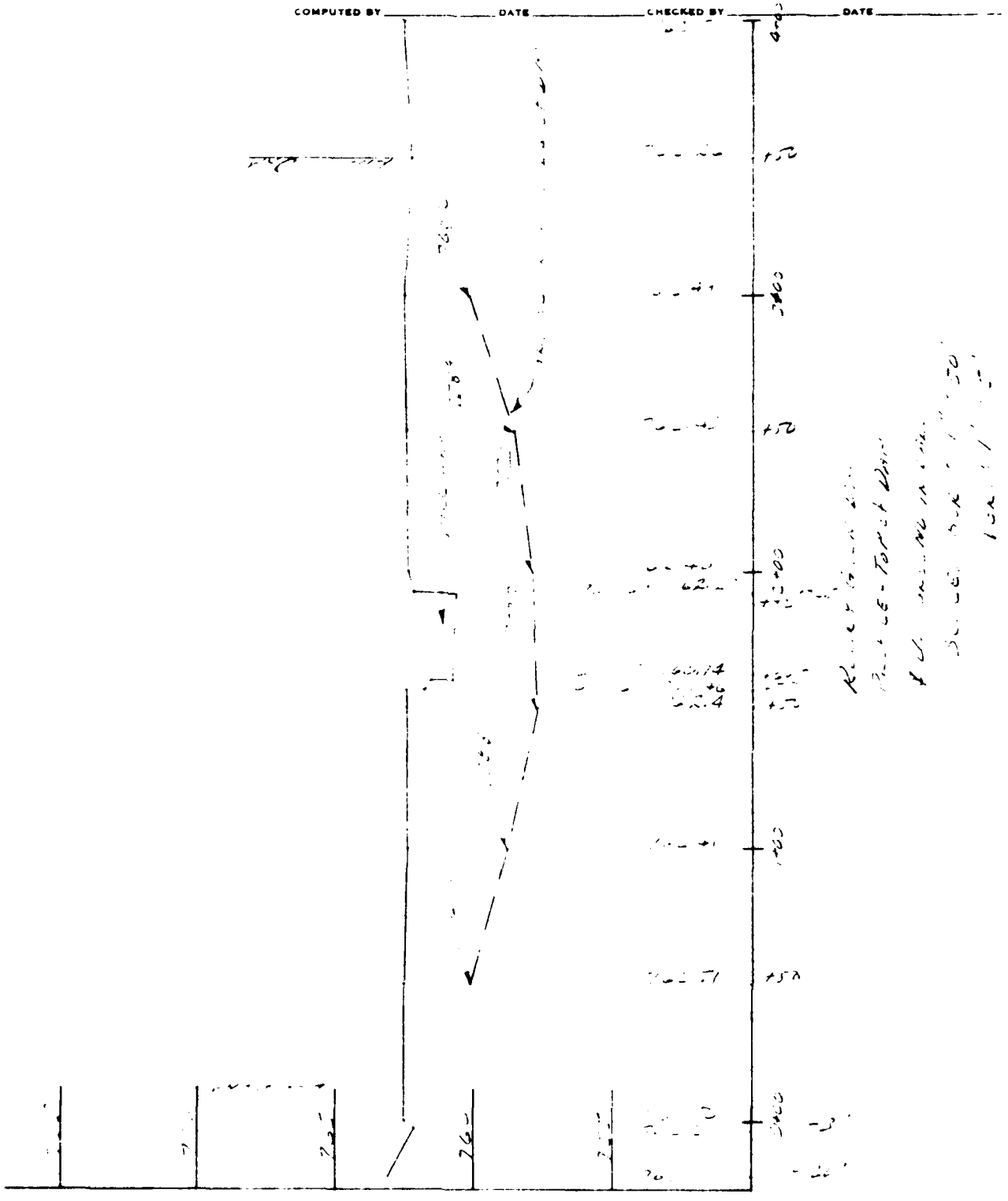
GANNETT FLEMING CORDDRY
AND CARPENTER, INC.
HARRISBURG, PA

SUBJECT _____ FILE NO. _____

_____ SHEET NO. _____ OF _____ SHEETS

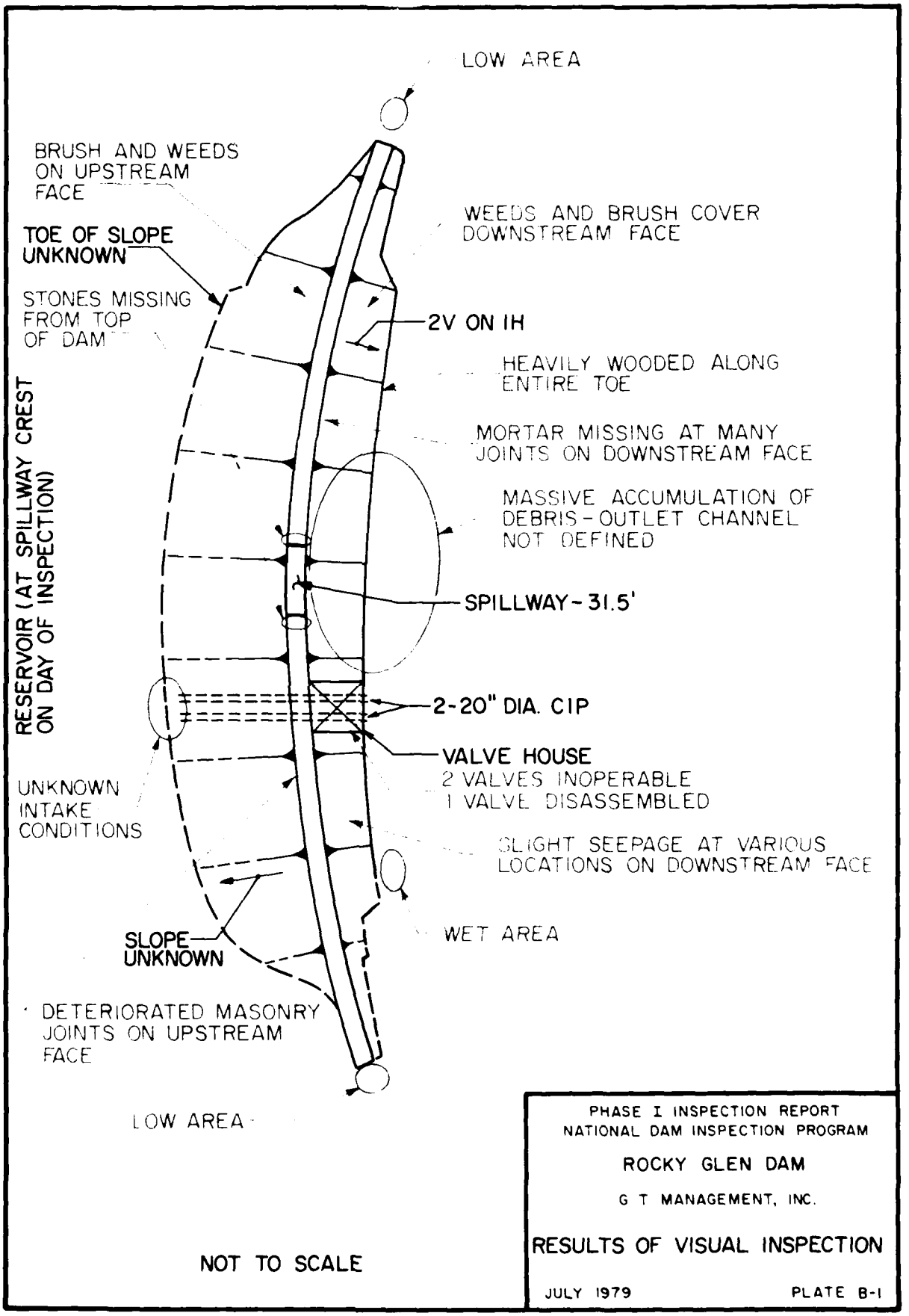
FOR _____

COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____



B-11

8519



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ROCKY GLEN DAM

G T MANAGEMENT, INC.

RESULTS OF VISUAL INSPECTION

JULY 1979 PLATE B-1

SUSQUEHANNA RIVER BASIN

DRY VALLEY CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

ROCKY GLEN DAM

NDI ID No. PA-00369
DER ID No. 35-2

G.T. MANAGEMENT, INC.

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1979

APPENDIX C

HYDROLOGY AND HYDRAULICS

APPENDIX C

HYDROLOGY AND HYDRAULICS

In the recommended Guidelines for Safety Inspection of Dams. the Department of the Army, Office of the Chief of Engineers (OCE), established criteria for rating the capacity of spillways. The recommended Spillway Design Flood (SDF) for the size (small, intermediate, or large) and hazard potential (low, significant, or high) classification of a dam is selected in accordance with the criteria. The SDF for those dams in the high hazard category varies between one-half of the Probable Maximum Flood (PMF) and the PMF. If the dam and spillway are not capable of passing the SDF without overtopping failure, the spillway capacity is rated as inadequate. If the dam and spillway are capable of passing one-half of the PMF without overtopping failure, or if the dam is not in the high hazard category, the spillway capacity is not rated as seriously inadequate. A spillway capacity is rated as seriously inadequate if all of the following conditions exist:

(a) There is a high hazard to loss of life from large flows downstream of the dam.

(b) Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.

(c) The dam and spillway are not capable of passing one-half of the PMF without overtopping failure.

APPENDIX C

Susquehanna River Basin

Name of Stream: Dry Valley Creek

Name of Dam: Rocky Glen Dam

NDS ID No.: PA-00369

DER ID No.: 35-2

Latitude: N 41° 21' 10" Longitude: W 75° 42' 25"

Top of Dam (~~low spot~~) Elevation: 762.35 (Design)

Streambed Elevation: 743.0 Height of Dam: 19 ft

Reservoir Storage at Top of Dam Elevation: 281 acre-ft

Size Category: Small

Hazard Category: High (see Section 5)

Spillway Design Flood: Varies from 1/2 PMF to PMF
Select PMF

UPSTREAM DAMS

Name	Distance from Dam (miles)	Height (ft)	Storage at top of Dam Elevation (acre-ft)	Remarks
Unnamed Pond	0.3	5	2	Ignored in analysis.

DOWNSTREAM DAMS

None

Susquehanna River Basin

Name of Stream: Dry Valley Creek

Name of Dam: Rocky Glen Dam

NDS ID No.: PA-00369

DER ID No.: 35-2

Latitude: N 41° 21' 10" Longitude: W 75° 42' 25"

DETERMINATION OF PMF RAINFALL

For Area A

which consists of Subareas A-1 of 1.5 sq. mile

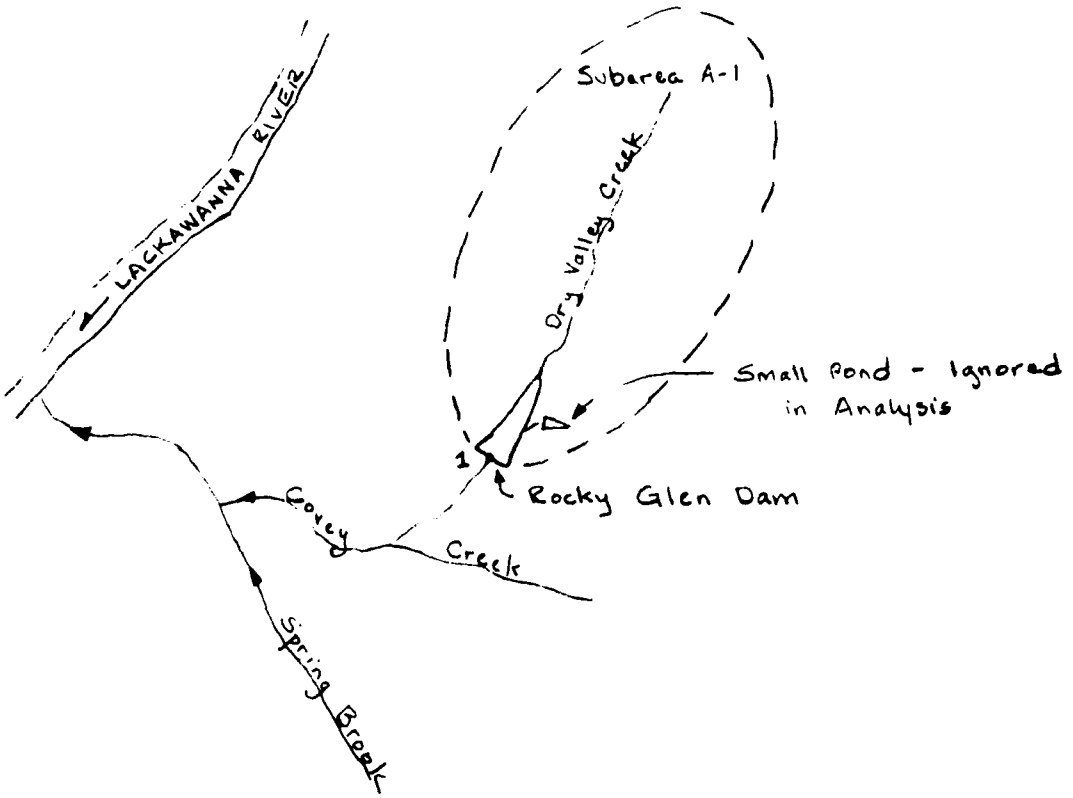
Total Drainage Area 1.5 sq. mile

PMF Rainfall Index = 22.15 in., 24 hr., 200 sq. mile

	Hydromet. 40 (Susquehanna Basin)	Hydromet. 33 (Other Basins)
Zone	N/A	N/A
Geographic Adjustment Factor	97%	1.0
Revised Index Rainfall	21.5	N/A

RAINFALL DISTRIBUTION (percent)

Time	Percent
6 hours	118
12 hours	127
24 hours	136
48 hours	142
72 hours	145
96 hours	N/A



Rocky Glen Dam

Sketch of System

Note: For location of stream cross-sections, see Plate C-1.

6513

Data for Dam at Outlet of Subarea A-1

Name of Dam: Rocky Glen Dam

Outlet Works Rating:	Outlet 1	Outlet 2	Outlet 3
Invert of Outlet	747.0	747.0	
Invert of Inlet	748.0	748.0	(Assumed)
Type	CIP	CIP	
Diameter (ft) = D	1.67	1.67	
Length (ft) = L	45	45	
Area (sq. ft) = A	2.19	2.19	
N	0.014	0.014	
K Entrance	0.5	0.5	
K Exit	1.0	1.0	
K Friction* = $29.1_N{}^2L/R^{4/3}$	0.8	0.8	
Sum of K	2.3	2.3	
$(1/K)^{0.5}$ = C	0.66	0.66	
Maximum Head (ft) = HM	15	15	
Q = C A $\sqrt{2g(HM)}$ (cfs)	45	45	
Q Combined (cfs)	N/A	90	

* R = Hydraulic Radius = (Area/Wetted Perimeter) = D/4 for Circular Conduits.

Data for Dam at Outlet of Subarea A-1

Name of Dam: Rocky Glen Dam

Storage Data:

Elevation		Area (acres)		Storage million gals	Storage acre-ft		Remarks
743.0	= ELEVO*	0		0	0		
760.7	= ELEV1	37	= A1	71	218	= S1*	Spillway crest
762.35		41.5		91	281		Design top of dam
780**		91					
	**						

* ~~ELEVO = ELEV1 - ($2S_1/A_1$)~~ $S_1 = A_1/3\ (ELEV1 - ELEVO)$

** Planimetered contour at least 10 feet above top of dam

Reservoir Area at Top of Dam is 4 percent of watershed.

Remarks: _____

Susquehanna River Basin

Name of Stream: Dry Valley Creek

Name of Dam: Rocky Glen Dam

NDS ID No.: PA-00369

DER ID No.: 35-2

Latitude: N 41° 21' 10" Longitude: W 75° 43' 25"

Drainage Area: 1.5 sq. mile

Data for Subarea: A-1 (see Sketch on Sheet C-4)

Name of Dam at Outlet of Subarea: Rocky Glen Dam

Drainage Area of Subarea: 1.5 sq. mile

Subarea Characteristics:

Assumed Losses: 1.0-inch initial abstraction + 0.05 in/hr

The following are measured from outlet of subarea to the point noted:

L = Length of Main Watercourse extended to the divide = 2.0 mile

L_{CA} = Length of Main Watercourse to the centroid = 1.1 mile

From NAB Data: Area 11, Plate E

Cp = 0.62

C_T = 1.5

$Tp = C_T \times (L \times L_{CA})^{0.3}$ = 1.90 (hrs)

Flow at Start of Storm = 1.5 cfs/sq. mile x Subarea D.A = 2.25 cfs

Computer Data:

QRCSN = -0.05 (5% of peak flow)

RTIOR = 2.0

Remarks: _____

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT Rocky Glen Dam — FILE NO.
SHEET NO. ___ OF ___ SHEETS
FOR National Dam Inspection Program
COMPUTED BY ___ DATE ___ CHECKED BY ___ DATE ___

Assumptions for Breach Analysis

Records indicate that a portion of Rocky Glen Dam is founded on overburden. It was assumed that substantial overtopping would cause downstream erosion and loss of passive resistance, which would result in failure by overturning. The following specific assumptions were made:

1. Flood occurrence - ½ PMF
2. Failure assumed to occur after 1.3 feet of overtopping.
3. Assumed failure reach length = 100'.
4. Failure [illegible] (SEE PLATE 2).

C-8A

8313

Selected Computer Output

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79

1	A1				NATIONAL DAM INSPECTION PROGRAM						
2	A2					DRY VALLEY CREEK					
3	A3					ROCKY GLEN DAM					
4	B	300	0	15	0	0	0	0	0	-4	0
5	B1	5									
6	J	1	5	1							
7	J1	1	.50	.10	.05	.02					
8	K	0	1			0	0	1			
9	K1	RUNOFF INTO ROCKY GLEN RESERVOIR									
10	M	1	1	1.5		0	0				
11	P	0	21.5	118	127	136	142	145			
12	T							1.0	.05		.04
13	W	1.90	.62								
14	X	2.25	-0.05	2.0							
15	K	1	1			0	0	1			
16	K1	ROUTE THROUGH ROCKY GLEN RESERVOIR									
17	Y				1						
18	Y1	1						-760.7	0		
19	SA	0	37	41.5	91						
20	SE	747	760.7	762.35	780						
21	SS	760.7	31.5	3.0	1.5						
22	SD	762.4	2.7	1.5	320						
23	K	99									

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO APPLIED TO FLOWS				
				RATIO 1 1.00	RATIO 2 .50	RATIO 3 .10	RATIO 4 .05	RATIO 5 .02
HYDROGRAPH AT	1	1.50	1	3954.	1977.	395.	198.	79.
	(	3.88)	(	111.95)(	55.98)(	11.20)(	5.61)(	2.24)(
ROUTED TO	1	1.50	1	3890.	1929.	383.	111.	36.
	(	3.88)	(	110.16)(	54.60)(	10.84)(	3.14)(	1.03)(

C-11

SUMMARY OF DAM SAFETY ANALYSIS

ROCKY GLEN DAM

PLAN 1 ..... INITIAL VALUE SPILLWAY CREST TOP OF DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	760.70	765.40	769.40
STORAGE	218.	218.	285.
OUTFLOW	0.	0.	269.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	769.75	2.35	389.	3890.	12.75	41.75	0.00
.50	767.79	1.39	345.	1928.	9.50	41.75	0.00
.10	762.54	.14	291.	293.	2.50	43.00	0.00
.05	761.81	0.00	261.	111.	0.00	43.75	0.00
.02	761.23	0.00	238.	36.	0.00	44.00	0.00

```
******    **********************
FLOOD     HOGRAPH PACKAGE (HEC-1)
DAM SA    Y VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
********************************
A1                          NATIONAL DAM INSPECTION PROGRAM
A2                                     DRY VALLEY CREEK
A3                                      ROCKY GLEN DAM
R      300       0       6       0       0       0       0       0      -4       0
B1       5
J        2       1       1
J1      .5
K        0       1                       0       0       1
K1        RUNOFF INTO ROCKY GLEN RESERVOIR
M        1       1     1.5               0       0                       1
P        0    21.5     118     127     136
T                                                      1.0     .05             .04
W     1.90     .62
X     2.25   -0.05     2.0
K        1       1                       0       0       1
K1        ROUTE THROUGH ROCKY GLEN RESERVOIR
Y                                1       1
Y1       1                                          -760.7       0
SA       0      37    41.5      91
SE     743   760.7  762.35     780
SS   760.7    31.5     3.0     1.5
SD   762.4     2.7     1.5     320
SB     100       0     743      .1   760.7     770
SB     100       0     743      .1   760.7   763.7
K        1       2                                       1
K1        ROUTE DOWNSTREAM
Y                                1       1
Y1       1                                              -1
Y6     .09     .07     .09     736     756    1500    .018
Y7       0     780       0     760     400     740     450     736     470     736
Y7     580     740    1050     760    1250     780
K        1       3                                       1
K1        CIGAR FACTORY
Y                                1       1
Y1       1                                              -1
Y6     .09     .07     .09     718     740     100    .017
Y7       0     780       0     725     100     720     130     718     150     718
Y7     180     720     500     740     710     760
K       99
```

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .50
HYDROGRAPH AT	1 (3.88)	1.50	1	1999. (56.60)(
			2	1999. (56.60)(
ROUTED TO	1 (3.88)	1.50	1	1949. (55.19)(
			2	25019. (708.45)(
ROUTED TO	2 (3.88)	1.50	1	1946. (55.11)(
			2	21401. (606.00)(
ROUTED TO	3 (3.88)	1.50	1	1946. (55.11)(
			2	21739. (615.58)(

SUMMARY OF D SAFETY ANALYSIS

ROCKY [illegible]EN DAM

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	760.70	760.70	762.40
STORAGE	218.	218.	285.
OUTFLOW	0.	0.	209.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	763.80	1.40	366.	1949.	9.30	17.70	0.00

PLAN 2 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	760.70	760.70	762.40
STORAGE	218.	218.	285.
OUTFLOW	0.	0.	209.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	763.73	1.33	362.	25019.	2.58	17.30	17.20

C-15

PLAN 1 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	1946.	739.9	17.80

PLAN 2 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	21401.	746.1	17.40

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	1946.	722.1	17.80

PLAN 2 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
	21739.	729.6	17.40

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

Rocky Glen Dam
Summary of Pertinent Results

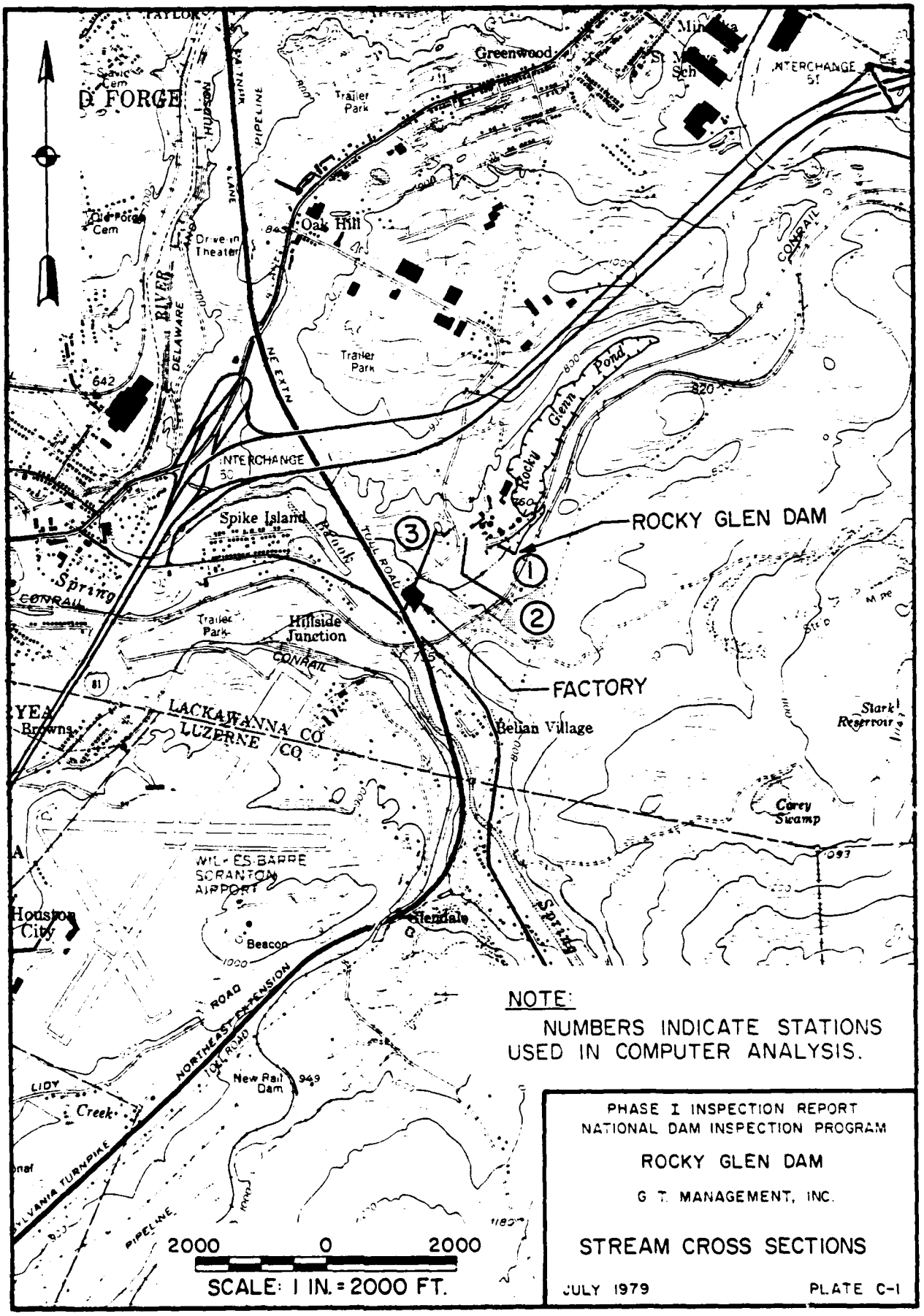
PMF Rainfall = 24.94 inches

Multi-ratio Analysis

Rocky Glen Dam	PMF	½ PMF
Runoff (inches)	22.45	11.23
Inflow (cfs)	3954	1977
Outflow (cfs)	3840	1928
Depth of Overtopping (ft)	2.55	1.39
Duration of Overtopping (hr)	12.75	9.50

Breach Analysis (½ PMF)

Section Number	Stream Depth (ft) No Failure	Stream Depth (ft) Failure	Δ Depth (ft)
2	3.9	10.1	6.2
3	4.1	11.6	7.5


ROCKY GLEN DAM
FACTORY
NOTE:
NUMBERS INDICATE STATIONS USED IN COMPUTER ANALYSIS.
2000 0 2000
SCALE: 1 IN. = 2000 FT.
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
ROCKY GLEN DAM
G T MANAGEMENT, INC.
STREAM CROSS SECTIONS
JULY 1979
PLATE C-1

SUSQUEHANNA RIVER BASIN

DRY VALLEY CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

ROCKY GLEN DAM

NDI ID No. PA-00369
DER ID No. 35-2

G.T. MANAGEMENT, INC.

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1979

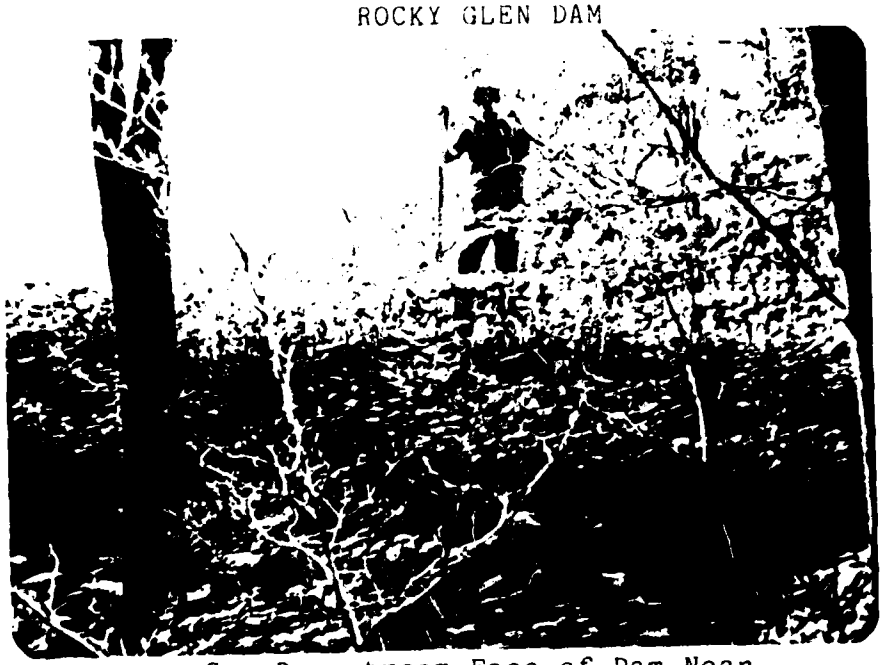
APPENDIX D

PHOTOGRAPHS

ROCKY GLEN DAM

A. Top of Dam Near Left Abutment

B. Top of Dam and Spillway



C. Downstream Face of Dam Near Left Abutment

D. Downstream Face of Dam Near Spillway

E. Spillway Weir and Debris

F. Debris at Toe of Spillway

G. Valve House and Outlet Conduits

H. Abandoned Railroad Embankment

SUSQUEHANNA RIVER BASIN

DRY VALLEY CREEK, LACKAWANNA COUNTY

PENNSYLVANIA

ROCKY GLEN DAM

NDI ID No. PA-00369
DER ID No. 35-2

G.T. MANAGEMENT, INC.

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1979

APPENDIX E

GEOLOGY

ROCKY GLEN DAM

APPENDIX E

GEOLOGY

1. General Geology. The damsite and reservoir are located in Lackawanna County. Lackawanna County was completely covered with ice during the last continental glaciation of Pleistocene time. The general direction of ice movement was S 35° -40° W. Glacial drift covers the entire County, except where subsequent erosion has removed it. Thick deposits of glacial outwash occur in many places along the Lackawanna River, and are 50 to 100 feet thick near Dickson, Scranton, and Moosic.

The only important structural feature in Lackawanna County is the Lackawanna Syncline, which traverses the County in a southwesterly direction. The syncline enters the County at the northeast corner as a narrow shallow trough, gradually deepens and broadens toward the southwest, and reaches its maximum development in Luzerne County. The exposed rock formations range from the post-Pottsville formations (youngest) through the Pottsville, Mauch Chunk shale, Pocono sandstone to the Damascus formation of the Catskill group (oldest). The rim rocks, the Pottsville formation and Pocono sandstone, have dips that rarely exceed 10° to 20° and form a rather simple syncline. The core rock, the post-Pottsville formations, are folded into a series of minor anticlines and synclines which trend about N 70° E. The rocks in the northwestern and southeastern parts of the County, outside of the limits of the Lackawanna Syncline, are generally horizontally stratified.

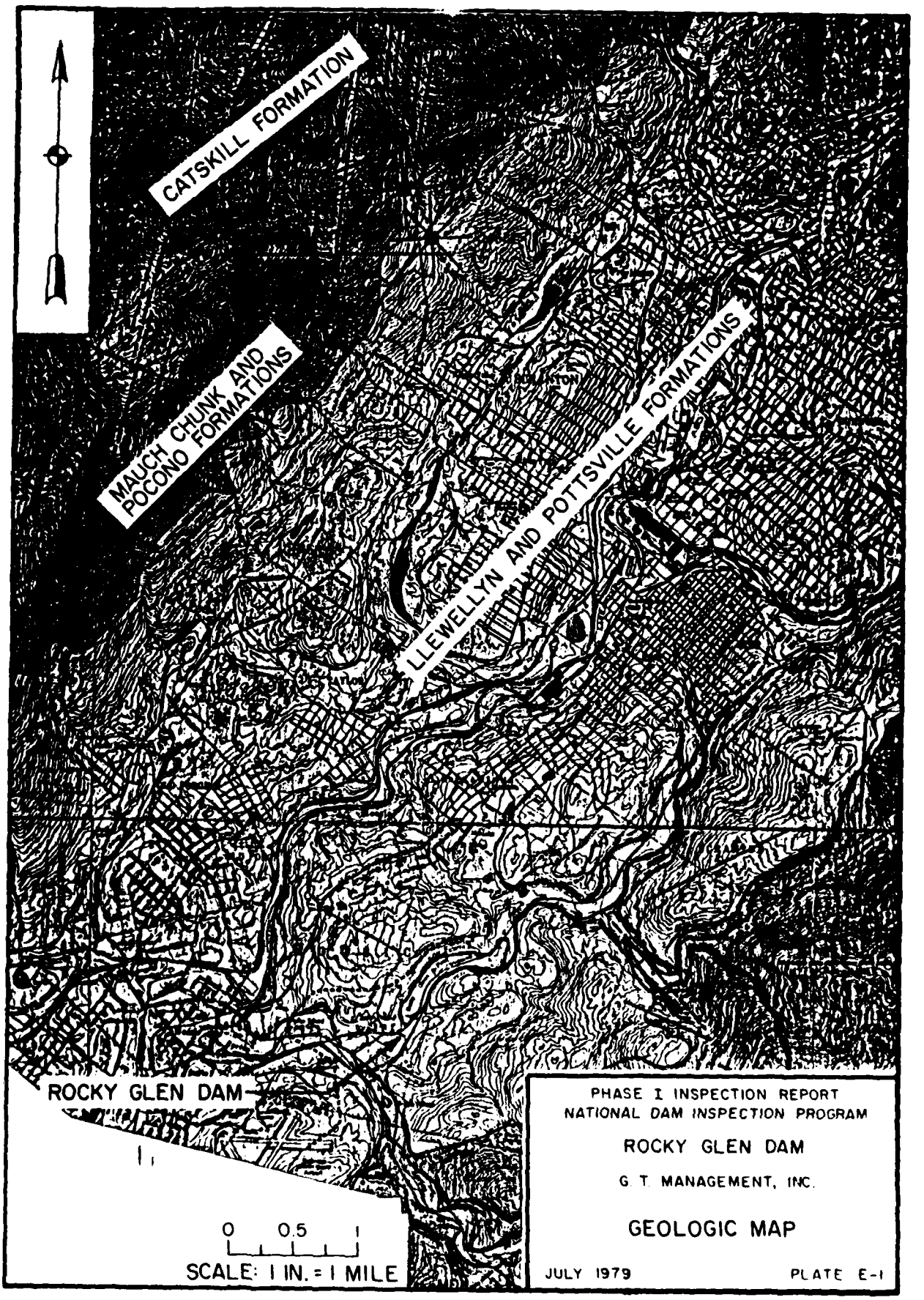
The Lackawanna River, in general, follows the axis of the Lackawanna Syncline. Southeast of the Lackawanna River, the rise in terrain is quite gradual and the crests of the high mountains are several miles from the Lackawanna River. Streams, such as Roaring Brook, Stafford Meadow Brook, and Spring Brook, have cut deep canyons through the mountains and follow a tortuous course to their confluence with the Lackawanna River near Scranton, Pennsylvania. Northwest of Lackawanna River, the mountains rise abruptly to a sharp ridge which in most places is somewhat higher than the country to the northwest. Consequently, most of the drainage in this part of the County flows westward by

way of Tunkhannock Creek. A few small tributary streams, however, such as Leggetts Creek, flow eastward from this area into the Lackawanna River. In the area of interest, the Lackawanna River streambed is founded in post-Pottsville formations. Proceeding uphill from the river, the older Pottsville formation, Mauch Chunk shale, Pocono sandstone, and Catskill continental group are encountered in turn. The tributary streams, in flowing down the mountains, have generally cut through or around the hard sandstone and conglomerate members, and have eroded their streambed into the softer shales and glacial till. The Catskill continental group of rocks underlies the greater part of Lackawanna County.

2. Site Geology. Rocky Glen Dam is founded on conglomerate and clay of the Pennsylvanian Llewellyn Formation. A report dated April 19, 1914 states that:

> "The rock formation under the dam is conglomerate rock. The structure bears upon rock for the greater part of its length, but near the east end, the rock dips down and is covered with a layer of clay. At this point the masonry is carried to a depth of 12 feet below the ground surface, and a distance of 30 feet into side hill."

The Llewellyn Formation is composed of interbedded quartz granules and pebble conglomerate; light gray fine to coarse grained conglomeratic sandstone; light gray to dark gray siltstone; medium gray claystone; gray/green and carbonaceous shales; and at least 17 coal beds. The rocks in the area strike NE and dip to the NW. Structure in the area is that of the valley and ridge province where the formation is folded into series of small anticlines and synclines. These structures are discontinuous and are seldom more than a few miles in length. Bedding is moderately well developed.



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ROCKY GLEN DAM

G. T. MANAGEMENT, INC.

GEOLOGIC MAP

JULY 1979 PLATE E-1